



Europäisches Patentamt
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Publication number:

0 026 985
A1

12

EUROPEAN PATENT APPLICATION

21 Application number: 80303160.8

22 Date of filing: 09.09.80

51 Int. Cl.: **A 23 K 1/16, A 23 K 1/18,**
A 23 L 1/227

30 Priority: 04.10.79 US 81975

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43 Date of publication of application: 15.04.81
Bulletin 81/15

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84 Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

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54 Dog food and method of feeding a dog therewith.

57 The object of the invention is to provide a dog food of improved acceptability.

Dog foods, no matter how nutritious, must be palatable for the dogs to receive the proper nutrition. This invention provides a dog food of improved palatability by the use of amino acid palatants selected from the group consisting of L-phenylalanine, L-tyrosine, L-tryptophan, L-methionine, L-arginine, L-isoleucine, L-leucine, L-serine, and any combination of these. The palatant is employed in any effective amount, usually from 0.001 to 0.8 wt. percent, on dry, intermediate-moisture, or canned dog food.

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TITLE MODIFIED
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DESCRIPTION

DOG FOOD OF IMPROVED ACCEPTABILITY

Technical Field

05 The present invention relates to dog foods, and particularly to dog foods having additives which make them more acceptable to dogs.

There is a continuing problem in making dog foods acceptable to dogs. While the art is well aware of the nutritional requirements of dogs, foods
10 formulated for them must be made sufficiently acceptable to assure that they are consumed so that the dog can take advantage of their nutritional benefits.

Most of the pet food acceptability enhancers known to the art turn out, after their identification
15 as such, to be components or derivatives of necessary dietary components for the particular animals involved. However, the identification of pet food acceptability enhancers is important industrially because it enables the production of tasty, nutritious pet
20 foods employing large amounts of by-products of the human industry. This helps in maintaining the lowest possible cost for human foods by providing a market for the by-products of that industry while at the same time decreasing the reliance of pet foods
25 on the choicer and more select raw materials. The identification of known food constituents as palat-

ants for particular species of animals in specific amounts is an important aspect of world food supply, and further improvements are needed.

Background Art

05 The use of additives to increase the acceptance of pet foods is well established in the prior art. For example, U.S. Patent No. 3,857,968 to G.J. Hass et al, discloses incorporating into an animal food an effective amount of a palatability improving
10 composition comprising fat and protein which has been conditioned by emulsifying the fat and treating the mixture with an enzyme mixture comprising lipase and protease. It is known that free fatty acids and amino acids are liberated by the enzymatic
15 reactions; however, the exact reason for the improvement in palatability obtained according to the disclosure of that patent is not fully understood. It is noted that the starting materials are typical dietary components, and the enzymatic reactions
20 which they undergo may heighten their natural attractiveness.

 Similarly, in U.S. Patent No. 3,745,023, to Greenberg et al, it is disclosed that a specially treated fat preparation can improve palatability
25 when applied to pet foods. The patentees suggest that a high concentration of free fatty acids in the fat promotes palatability. Also suggestive of specific types of certain combinations of additive materials are United Kingdom Patent Specification
30 1,293,378, and Netherlands Patent Publication 73-13644. The United Kingdom patent discloses a synergistic mixture of squalene, oleyl alcohol, oleic acid and linoleic acid for improving the acceptability of livestock and pet foods. The

Netherlands patent publication discloses that specific free fatty acids, caprylic and caproic acid, improve the aroma of dog foods.

05 Amino acids are known to have widely varying
aromas and flavors depending on their type and
concentration. There is, however, nothing which
indicates their inherent attractiveness to dogs. In
U.S. Patent No. 3,653,908 to Buck et al, it is
disclosed that amino acids released by the hydro-
10 lysis of meat are flavorful to cats, especially when
reacted with reducing sugars. J. Boudreau et al in
Chemical Stimulus Determinants of Cat Geniculate
Ganglion Chemoresponsive Group II Unit Discharge,
Chemical Senses and Flavor, 1 (1975), pages 495-517,
15 and Cat Neural Taste Responses to Nitrogen Compounds,
ACS Symposium Series 26 (1976); and White, et al, in
Taste Preferences of the Cat for Neuro Physiologically
Active Compounds, Physiological Psychology, 1975,
Vol. 3 (4), pages 405-410, discuss their work in the
20 neurophysiology of the cat wherein they tested cats
for taste response to aqueous solutions of a number
of compounds, including amino acids. By this work
they found several amino acids, including L-proline,
L-cysteine and L-histidine, to be taste active in 50
25 millimolar solutions under the conditions of testing.
Under these same conditions, L-phenylalanine, L-tyro-
sine, L-tryptophan and L-isoleucine were found to
inhibit the same groups of neural units that were
excited by the others.

30 In a recent Belgian patent publication, No.
867,130 L- and D-lysine are disclosed as palatants,
i.e., palatability improvers for dog foods. However,
the effects of the amino acids are not clearly
distinguished from those of moisture by the method
35 disclosed.

It is also known in the art to employ various levels of various amino acids to improve the nutrition of various foods deficient in certain of the essential amino acids. This technique for improving the nutritional value of foods has, however, been of limited commercial value in view of the intense and often unpleasant taste of these materials at the levels required to significantly improve nutrition. One canned dog food formulation is known wherein methionine was employed at a level of 0.025% based on the weight of the food; however, no palatability improvement was ever disclosed in connection with this addition which was done for nutritional improvement.

15 Disclosure of Invention

In accordance with the present invention an improved, nutritionally-balanced dog food is provided which comprises fat, protein, carbohydrates, vitamins and minerals, wherein the improvement comprises: an added amount of amino acids between about 0.001 and 0.8%, selected from the group consisting of L-phenylalanine, L-tyrosine, L-tryptophan, L-methionine, L-arginine, L-isoleucine, L-leucine, L-serine, and combinations of any of these, the amount being effective to increase the palatability of the dog food for dogs.

The term palatability is broad and encompasses all of the various properties of dog foods, sensed by the consuming animal which determine the overall acceptability of the food. Among these properties are texture, taste and aroma. It is believed that the present invention increases palatability as a whole, primarily through improving the taste of the food.

The specific amino acids which are included within the scope of the present invention, will be referred to generically as amino acid palatants. Specifically identified as useful palatants according to the present invention are L-phenylalanine, L-tyrosine, L-tryptophan, L-methionine, L-arginine, L-isoleucine, L-leucine, L-serine, and combinations of these. Preferred among these are L-tryptophan, L-arginine, L-isoleucine, L-leucine, and L-serine, and particularly L-tryptophan, L-arginine, L-isoleucine. These materials can be selected or prepared from any suitable source. It is to be understood that the term amino acid is used herein identifies the noted compounds in their free and/or soluble salt form. It should be cautioned, however, that the method of recovery or preparation of pure or synthetic compounds can alter the effectiveness of the compounds in improving palatability of a dog food.

The amino acid palatants identified by the present invention can be employed in any amount which is effective to improve the palatability of a dog food for dogs. No attempt is made here to establish a range of concentrations of universal applicability for all different types of dog foods for serving under all different types of conditions to all different types of dogs. It is believed that levels within the range of from about 0.001 up to about 0.8%, more preferably from about 0.005 to about 0.5%, can be employed with effectiveness, depending on the method of application and the type of food. Levels of from about 0.01 to about 0.1% based on the total weight of the food have been effective for dogs when surface coated or blended into the food. This range is, therefore, considered

most preferred. However, effective levels for at least some of the materials identified as palatants by this invention will be outside of this range.

05 The amino acid palatants are incorporated into the desired food products in any suitable manner. In testing already conducted, it has been found that they can be coated onto the exterior of a food or intimately mixed with the food ingredients prior to final formulation. Those skilled in the art will
10 understand that by placing the palatant on the surface of the foods it will increase its impact as compared to a product having it incorporated into the interior of the product. Thus, spraying onto the surface of the dog food is the most preferred
15 manner of application where this type of processing step is compatible with the overall processing of the food involved.

It may be necessary to dilute the amino acid palatants with a suitable material prior to applica-
20 tion by spraying. The diluent can be either a liquid or a solid component which is compatible with the food. Thus, it can be employed as part of a powdery, emulsified, or other coating such as those which are normally applied to the surface of
25 dry dog foods.

Where it is desired to employ it by mixing into the interior of the dog food, it is again simply accomplished in a manner compatible with normal processing. And, if experience shows that the
30 particular method of addition causes the presence of areas of unduly exaggerated concentration due to improper mixing, it may be desirable to dilute the palatant prior to mixing.

The amino acid palatants identified according
35 to the present invention can be employed on dog

foods of all varieties. Because providing nutrition is of overriding concern, it is important to formulate all dog foods such that they are nutritionally complete. By nutritionally balancing each individual food in this manner, it is not then necessary for the dog owner to balance the quantities of different foods supplied. Thus, the nutritional intake of the dog is assured so long as it intakes a minimum amount of food. Nutritionally-balanced foods contain protein, carbohydrates, fats, vitamins and minerals in the amounts known in the art and established by feeding tests to be sufficient for the proper growth and maintenance of the dog.

The amino acids palatants identified according to this invention can be employed in dry, intermediate-moisture or canned dog foods. The dry dog foods contain less than 15% moisture, and will typically have a dry, crunchy texture due to the maintenance of the moisture below about 8%. The intermediate moisture foods will have moisture above 15% and less than about 50%, and will typically have a soft texture with moisture contents in the range of from 20 to 30%. The canned foods have moistures above 50% and typically about 75%.

Typical of the dry dog foods are those disclosed in U.S. Patent No. 3,119,691. Disclosed in this patent is a dry pet food having a gravy-forming coating thereon. It is desirable to include the palatant in the gravy-forming material such that it will disperse within the gravy in the serving bowl. Also suitable for incorporation of the amino acid palatants are the intermediate-moisture dog foods of the type disclosed in U.S. Patent No. 3,202,514 to Burgess et al. In preparing these types of foods, the palatant can either be mixed intimately during

the process prior to extrusion or coated on the exterior thereof. The palatants identified according to the present invention can also be employed in conventional canned dog foods by adding them in any suitable manner.

Best Mode For Carrying Out The Invention

The following examples set forth the best mode for carrying out the invention. These examples are intended to aid in describing the present invention to those skilled in the art and are not to be taken as limiting in any regard. Unless otherwise indicated, all parts and percentages are by weight.

Example I

According to this example, the effect of various amino acids on the palatability of a dry dog food formulated for normal adult dogs is tested on normal adult dogs by incorporating into the food, as a portion of a fat coating, small but effective amounts of the amino acids and testing them against a control product.

As the base dog food, an uncoated, extruder-kibbled product is employed.

This formulation is prepared and processed in the manner described in the aforementioned U.S. Patent No. 3,119,691 except that the coating taught therein is omitted. To prepare a test food coating containing a palatant according to this invention, 0.1% of the amino acid, 3% distilled water and 6% of bleachable fancy tallow, all percentages based on the total weight of the food, are emulsified and then sprayed onto the kibbled dog food as it is tumbled in a rotating drum. A control product is also prepared in the same manner but without the amino acid.

The amino-acid treated samples were then split into four groups with controls as follows:

	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>
	1/L-Alanine	1/Control	1/L-Leucine	1/Control
05	2/Control	2/Glutamine	2/L-Lysine	2/L-Serine
	3/L-Arginine	3/L-Glutaminic Acid	3/L-methionine	3/L-Threonine
	4/L-Asparagine	4/Glycine	4/Control	4/L-Tyrosine
	5/Aspartic Acid	5/L-Histidine	5/L-Phenylalanine	5/L-Tryptophan
10	6/L-Cysteine	6/Control	6/L-Proline	6/Control
	7/Control	7/L-Isoleucine	7/Control	7/L-Valine

For each of the four Groups, seven, three-way comparison tests were arranged as shown below:

	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>
15	6 / 7 / 2	3 / 4 / 6	3 / 1 / 7	1 / 3 / 7
	4 / 5 / 7	5 / 6 / 1	5 / 3 / 2	5 / 7 / 4
	3 / 4 / 6	2 / 3 / 5	4 / 2 / 1	2 / 4 / 1
	2 / 3 / 5	7 / 1 / 3	6 / 4 / 3	4 / 6 / 3
20	1 / 2 / 4	6 / 7 / 2	7 / 5 / 4	3 / 5 / 2
	5 / 6 / 1	1 / 2 / 4	1 / 6 / 5	7 / 3 / 6
	7 / 1 / 3	4 / 5 / 7	2 / 7 / 6	6 / 1 / 5

Thus, for each of the groups containing five different amino acids, each amino acid is fed three times within the group and each control is fed twice within the group. Each group was fed to 40 dogs daily for two consecutive days. For the seven, three-way comparisons in each group, the first five were fed to six dogs and the last two were fed to five dogs, making a total of 40 dogs per day.

The data was analyzed both for average rank and average preference ratio for each product over two

days of testing. In determining the average rank, a rank of 3 was assigned, for each dog to the product with the highest consumption on the two days, a rank of 2 was assigned to the product with the second
05 highest consumption on the two days, and a rank of 1 was assigned to the product with the lowest consumption on the two days. If all products are equally preferred then the ranks for all products would be near 2.0. High ranks indicate products with high
10 preference and low ranks indicate products with low preference. The average ranks for all products are listed in Table 1.

The average preference ratios (APR) indicate the relative weights of the various foods consumed
15 in each three-way comparison. To determine the APR, the preference ratio for each three-way comparison is first determined by dividing the weight of one sample consumed by total weight of all foods consumed. The APR is simply the average of the preference ratios for a particular food over the term of
20 testing. The APR values are also listed in Table 1.

Table 1

Test Group	Amino Acids	Rank For Dog Groups							Average	
		1	2	3	4	5	6	7	Rank	APR
5	L-Alanine					2.0	2.0	2.0	2.0	.30
	Control	1.7			1.6	1.5			1.6	.26
	L-Arginine			2.7	2.8			2.8	2.8	.49
	L-Asparagine		2.4	1.8		2.5			2.2	.37
	Aspartic Acid		1.2		1.6		1.4		1.4	.22
10	L-Cysteine	2.7		1.6			2.6		2.3	.44
	Control	1.7	2.4					1.2	1.8	.26
	Control		2.0		1.3		2.2		1.8	.30
	Glutamine			1.7		1.6	2.6		2.0	.31
	L-Glutamic Acid	2.2		2.0	2.2				2.1	.32
15	Glycine	1.8					1.2	1.2	1.4	.24
	L-Histidine		1.2	2.3				1.8	1.8	.31
	Control	2.0	2.8			1.6			2.1	.37
	L-Isoleucine				2.5	2.8		3.0	2.8	.48
	L-Leucine	2.8		2.6			2.4		2.6	.49
20	L-Lysine		2.2	1.8				1.0	1.7	.22
	L-Methionine	1.2	2.8		1.9				2.0	.30
	Control			1.7	1.5	2.5			1.9	.24
	L-Phenylalanine		1.0			1.0	1.2		1.1	.22
	L-Proline				2.6		2.4	3.0	2.7	.53
25	Control	1.9				2.5		2.0	2.1	.31
	Control	2.0		1.8				1.4	1.7	.29
	L-Serine			2.9		1.8	2.8		2.5	.43
	L-Threonine	2.2			1.2	1.5			1.6	.26
	L-Tyrosine		2.0	1.3	1.8				1.7	.27
30	L-Tryptophan		2.8			2.8		3.0	2.9	.49
	Control				3.0		2.0	1.6	2.2	.36
	L-Valine	1.8	1.2				1.2		1.4	.22
	Control									
	Control									

The data was analyzed with the aid of Durbin's χ^2_r test for ranked data from a balanced incomplete block design to determine differences between the ranks. The statistical testing indicated significant differences in the preferences of the products in four test groups at the 99.5 percent level of confidence. At this level, the chance of observing these results if all products are equally preferred is less than 1 in 200. The relative preferences of the amino acids are:

05	Preferred to control:	L-Arginine
		L-Isoleucine
		L-Leucine
		L-Proline
15		L-Serine
		L-Tryptophan
	Less preferred than control:	Aspartic Acid
		Glycine
		L-Phenylalanine
20		L-Valine

Example II

A further series of dog food samples were prepared containing the amino acids at the levels indicated in Table 2. The type of dog food and manner of incorporation of amino acid are also shown. IM means intermediate-moisture, D means dry, I means incorporated internally, and S means surface coated. Some samples were fed as is "A" and some with an equal weight of water as indicated by "1:1" in the table. In the results column, "P" means significant Preference, "L" means significant loss and "N" means no statistically significant difference for that test run.

Table II

5	Amino Acid	Level	Food Type	How Fed	Result
		.1	IM-I	A	P
		.01	IM-I	A	P
		.01	IM-I	A	P
		.01	IM-I	A	P
10		.1	D-S	1:1	P
		.01	D-S	1:1	L
	L-Cysteine	.001	D-S	1:1	P
		.1	D-I	1:1	P
		.01	D-I	1:1	N
15		.001	D-I	1:1	N
		.05	IM-S	A	P
		.1	IM-S	A	P
		.01	D-S	A	P
		.1	D-S	A	P
20		.1	D-S	A	P
		.001	IM-I	A	N
		.01	IM-I	A	P
		.1	IM-I	A	P
25	L-Phenylalanine	.01	IM-I	A	P
		.05	IM-I	A	P
		.1	D-I	A	N
		.01	D-I	A	N
		.1	D-S	A	N
30	L-Threonine	.1	D-S	A	N
	L-Tyrosine	.01	IM-I	A	P
		.1	IM-I	A	N
35	L-Tryptophan	.01	IM-I	A	P
		.1	IM-I	A	P
		.01	IM-I	A	P
40	L-Methionine	.1	IM-I	A	P
		.1	D-S	A	P
	L-Arginine	.1	D-S	A	N
45	L-Proline	.1	D-S	A	P
	L-Serine	.1	D-S	A	N
50	Glycine	.1	D-S	A	N

05 The above description is for the purpose of teaching those skilled in the art how to practice the present invention and is not intended to recite all the possible modifications and variations thereof which will become apparent to the skilled worker upon reading. It is intended, however, that all such modifications and variations be included within the scope of the invention which is defined by the following claims.

CLAIMS

- 05 1. In a nutritionally-balanced dog food comprising fat, protein, carbohydrates, vitamins and minerals, the improvement which comprises: an added amount of and amino acid, between about 0.001 to 0.8%, selected from the group consisting of L-phenylalanine, L-tyrosine, L-tryptophan, L-arginine, L-isoleucine, L-leucine, L-serine, and combinations of any of these, the amount being effective to
10 increase the palatability of the dog food for dogs.
2. A nutritionally-balanced dog food according to Claim 1 having a moisture content of less than 15% by weight.
- 15 3. A nutritionally-balanced dog food according to Claim 1 wherein the moisture content is between about 15 and about 50% by weight.
4. A nutritionally-balanced dog food according to Claim 1 having a moisture content in excess of 50% by weight.
- 20 5. A nutritionally-balanced dog food according to Claim 1 wherein the amino acid is selected from the group consisting of L-tryptophan, L-arginine, L-isoleucine, L-leucine, L-serine, and combinations of these.
- 25 6. A nutritionally-balanced dog food according to Claim 5 wherein the amino acid is selected from the group consisting of L-tryptophan, L-arginine, L-isoleucine, and combinations of these.
- 30 7. A nutritionally-balanced dog food according to Claim 1 wherein the amino acid is added in an amount of from about 0.005 to about 0.5% based upon the weight of the dog food.

8. A nutritionally-balanced dog food according to Claim 1 wherein the amino acid is incorporated internally in the food.

05 9. A nutritionally-balanced dog food according to Claim 1 wherein the amino acid is coated on the exterior of the food.

10. An improved method for feeding a dog comprising:

10 (a) preparing a nutritionally-balanced dog food comprising fat, protein, carbohydrates, vitamins and minerals, which further comprises an added amount of an amino acid, between about 0.001 to 0.8%, selected from the group consisting of
15 L-phenylalanine, L-tyrosine, L-tryptophan, L-arginine, L-isoleucine, L-leucine, L-serine, and combinations of these, the amount being effective to improve palatability of the dog food for dogs; and

(b) feeding the food to a dog.

20 11. A nutritionally-balanced dog food with a moisture content of less than 50% and comprising fat, protein, carbohydrates, vitamins and minerals, the improvement which comprises: an added amount, between about 0.005 to 0.5%, of L-methionine, the amount being effective to increase the palatability
25 of the dog food for dogs.



EUROPEAN SEARCH REPORT

0026985

EP 80 30 3160

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	US - A - 3 698 912 (MILTON WINITZ)		
A	CHEMICAL ABSTRACTS, vol. 91, no. 19, 5th November 1979, no. 152006a Columbus, Ohio, U.S.A. J.C. BOUDREAU: "Flavor of foods and beverages, Cat and human taste responses to L- α -amino acid solutions" & FLAVOR FROM BLENDED: CHEM. TECHNOL., (FRAC. CONF.) 1978, 231-46 Abstract		TECHNICAL FIELDS SEARCHED (Int. Cl. 3)



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EUROPEAN SEARCH REPORT

0026985
Application number

EP 80 30 3160

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>FR - A - 2 140 135</u> (SANDOZ S.A.)</p> <p>* Claims 1,2; page 1, lines 1-5 *</p> <p>& GB - A - 1 398 561</p> <p>--</p>	1,5-11	<p>A 23 K 1/16</p> <p>1/18</p> <p>A 23 L 1/227</p>
P	<p>CHEMICAL ABSTRACTS, vol. 93, no. 5, 4th August 1980, no. 44396h Columbus, Ohio, U.S.A.</p> <p>& JP - A - 80 09709 (NIPPON PET FOOD K.K.; KYODO SHIRYO (FEED) CO., LTD.) 23-01-1980</p> <p>* Abstract *</p> <p>--</p>	1,9,10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.)
D	<p><u>FR - A - 2 390 907</u> (RALSTON PURINA CO.)</p> <p>* Whole document *</p> <p>& BE - A - 867 130</p> <p>--</p>	1-11	<p>A 23 K 1/16</p> <p>1/18</p> <p>A 23 L 1/227</p>
D,A	<p>PHYSIOLOGICAL PSYCHOLOGY, vol. 3, no. 4, 1975, pages 405-410 T.D. WHITE et al.: "Taste preferences of the cat for neurophysiologically active compounds"</p> <p>--</p>		
A	<p>JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, vol. 17, no. 4, July-August 1969, pages 689-695 Washington D.C., U.S.A. J. KIRIMURA et al.: "The contribution of peptides and amino acids to the taste of foodstuffs"</p> <p>--</p>		
A	<p><u>US - A - 3 925 568</u> (G.V. RAO, O.B. GERRISH)</p> <p>./.</p>		
<p><input checked="" type="checkbox"/> The present search report has been drawn up for all claims</p>			<p>&: member of the same patent family.</p> <p>corresponding document</p>
Place of search		Date of completion of the search	Examiner
The Hague		09-01-1981	GALLIGANI

